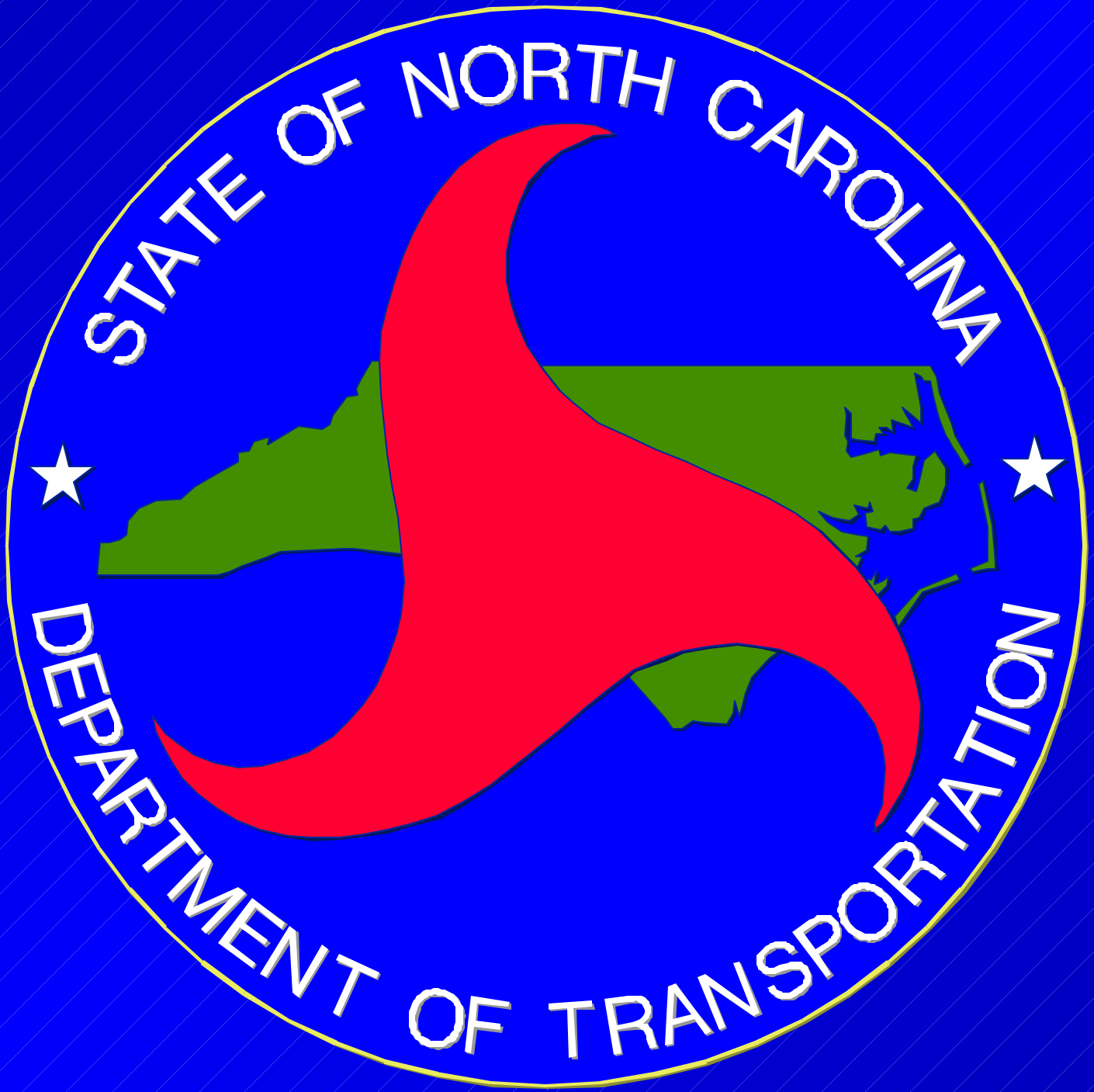
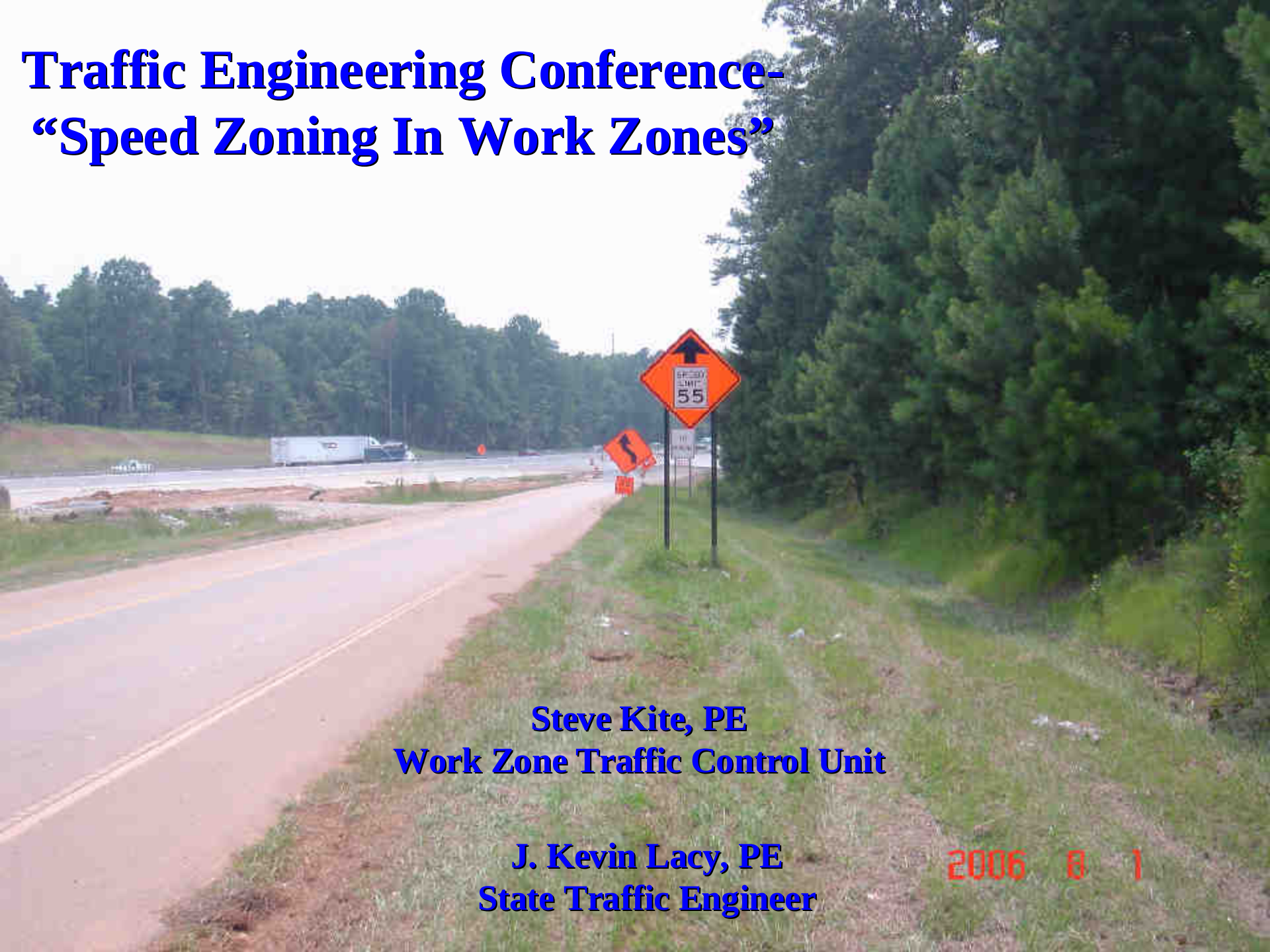

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

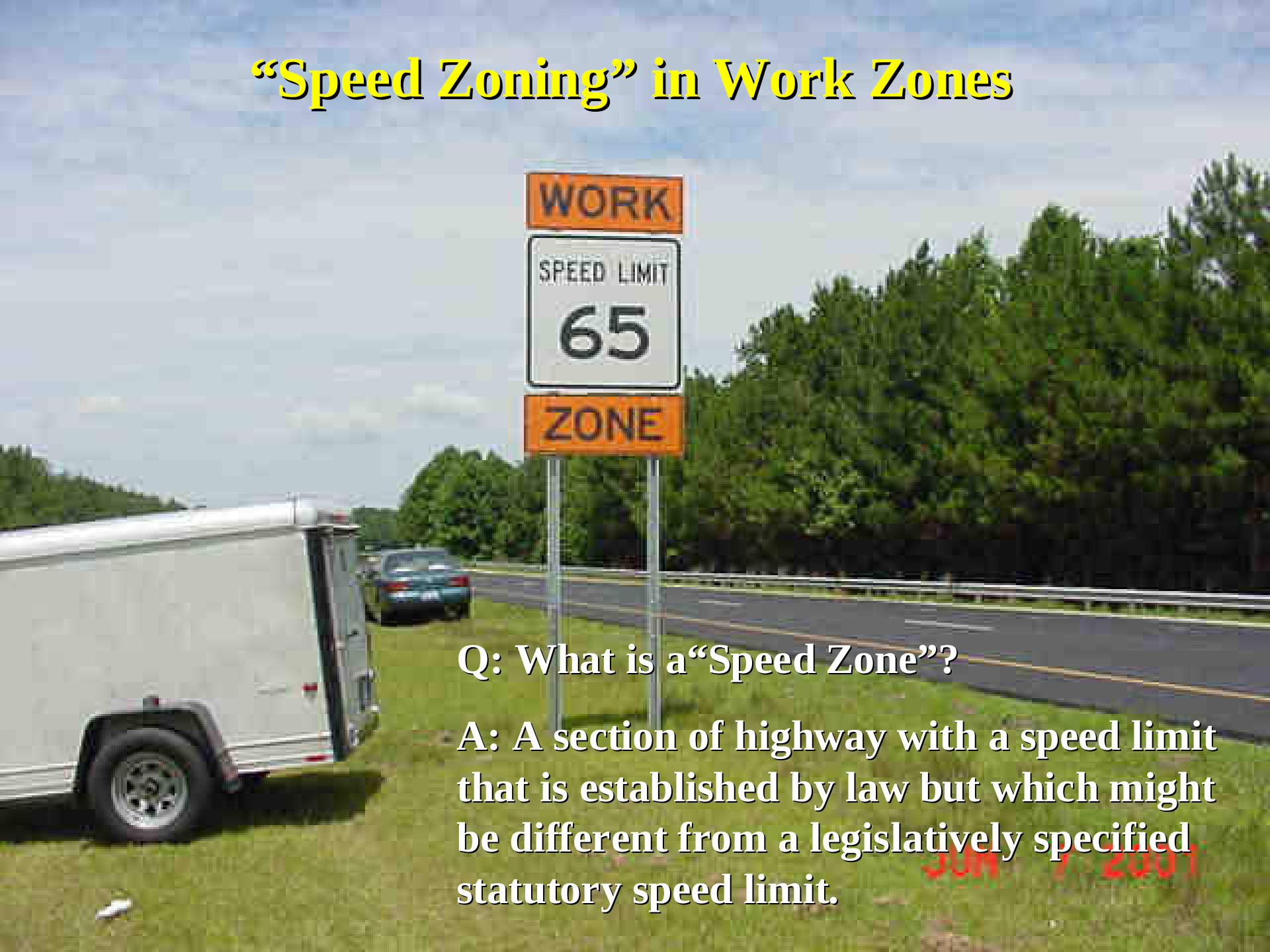
Traffic Engineering Conference- "Speed Zoning In Work Zones"



Steve Kite, PE
Work Zone Traffic Control Unit

J. Kevin Lacy, PE
State Traffic Engineer

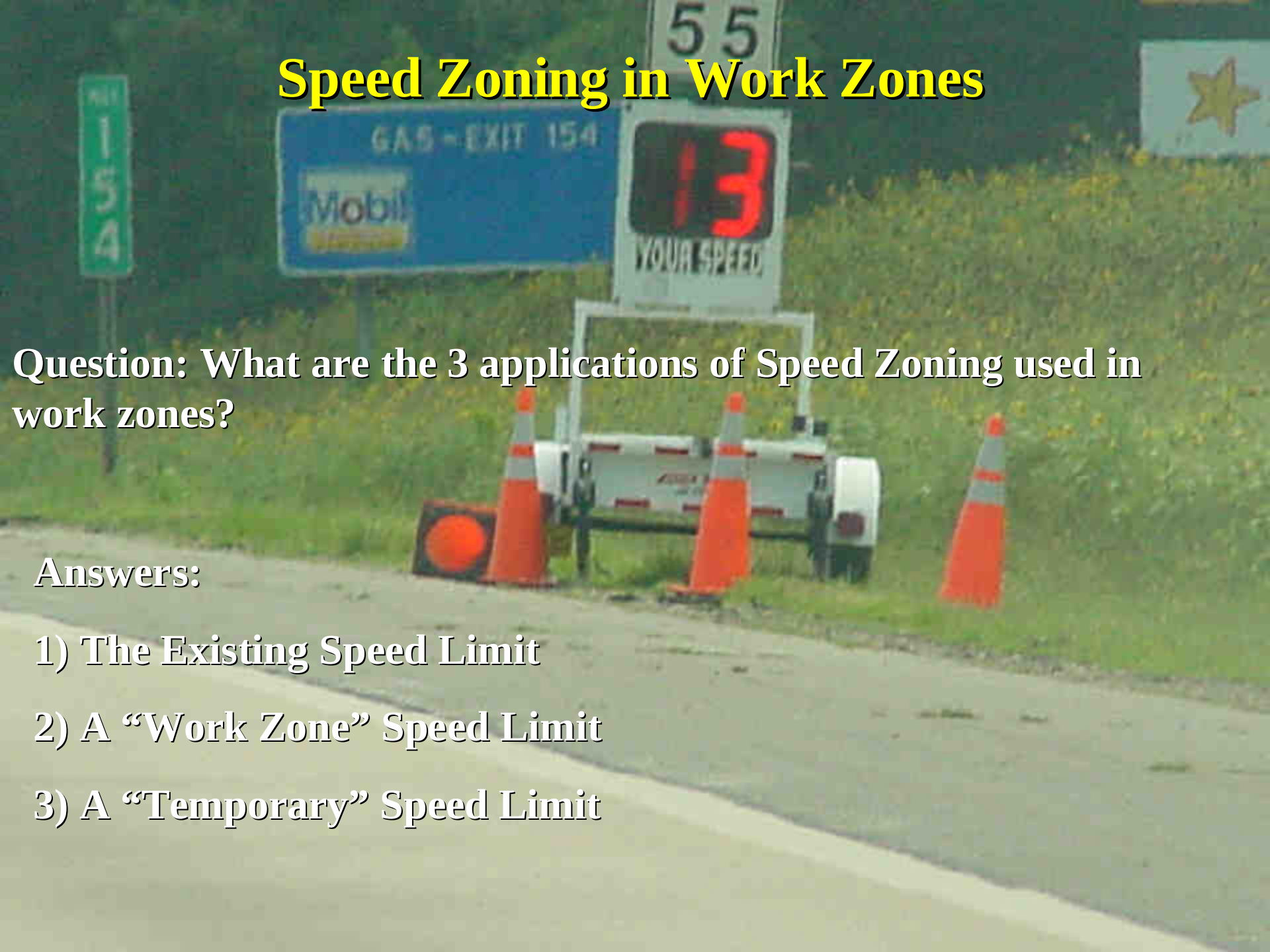
“Speed Zoning” in Work Zones



Q: What is a“Speed Zone”?

A: A section of highway with a speed limit that is established by law but which might be different from a legislatively specified statutory speed limit.

Speed Zoning in Work Zones



Question: What are the 3 applications of Speed Zoning used in work zones?

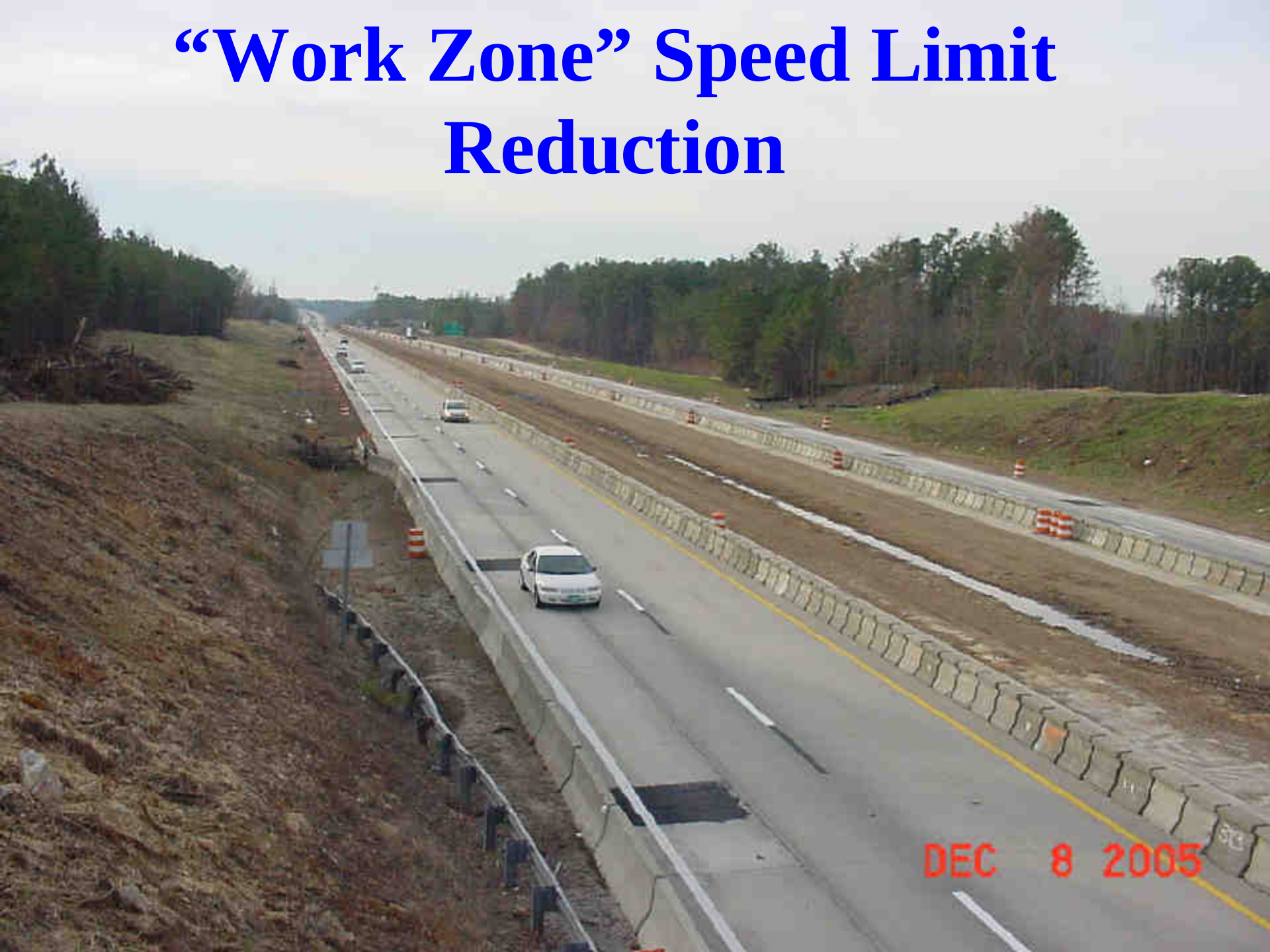
Answers:

1) The Existing Speed Limit

2) A "Work Zone" Speed Limit

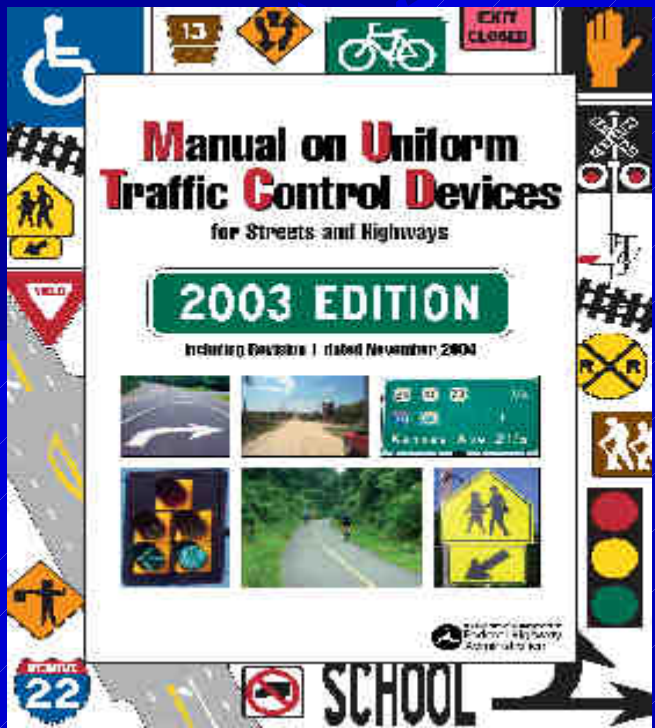
3) A "Temporary" Speed Limit

“Work Zone” Speed Limit Reduction

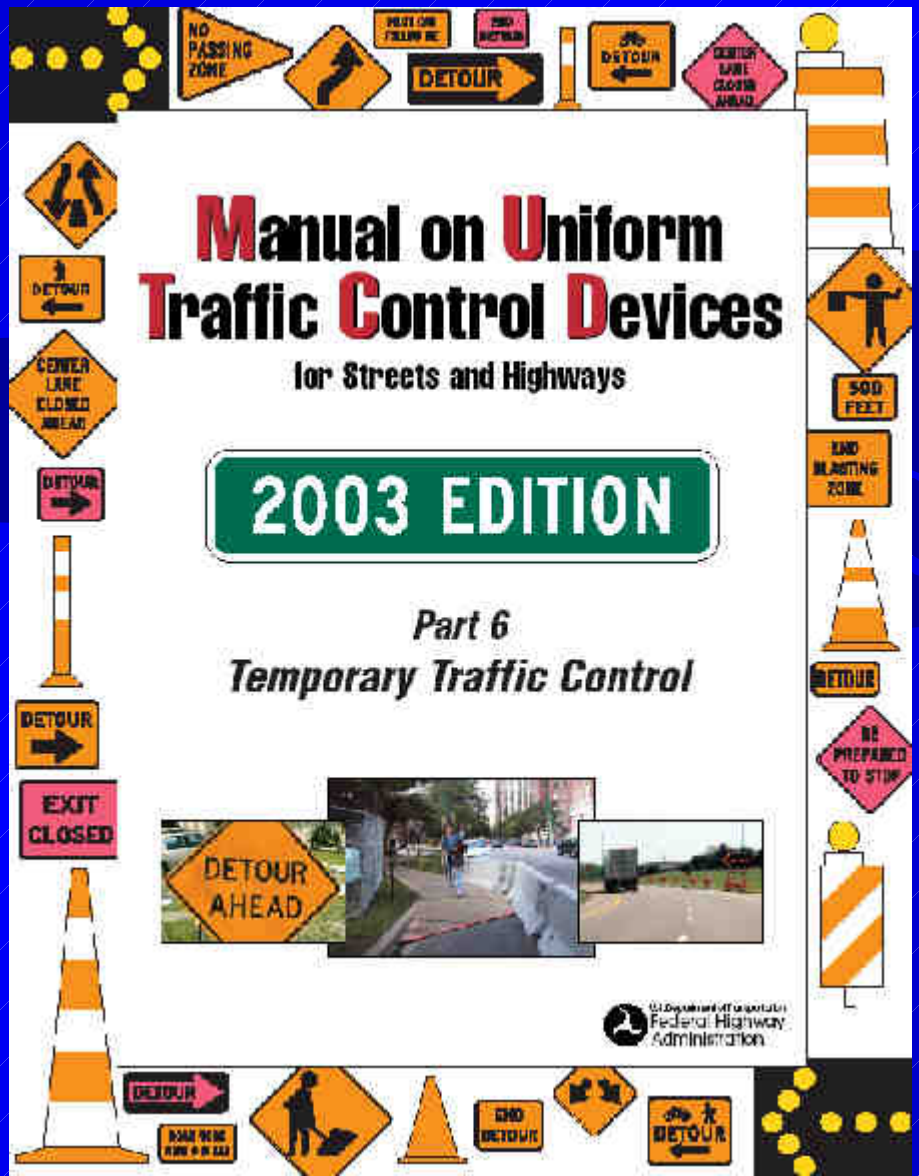


“Work Zone” Speed Limit

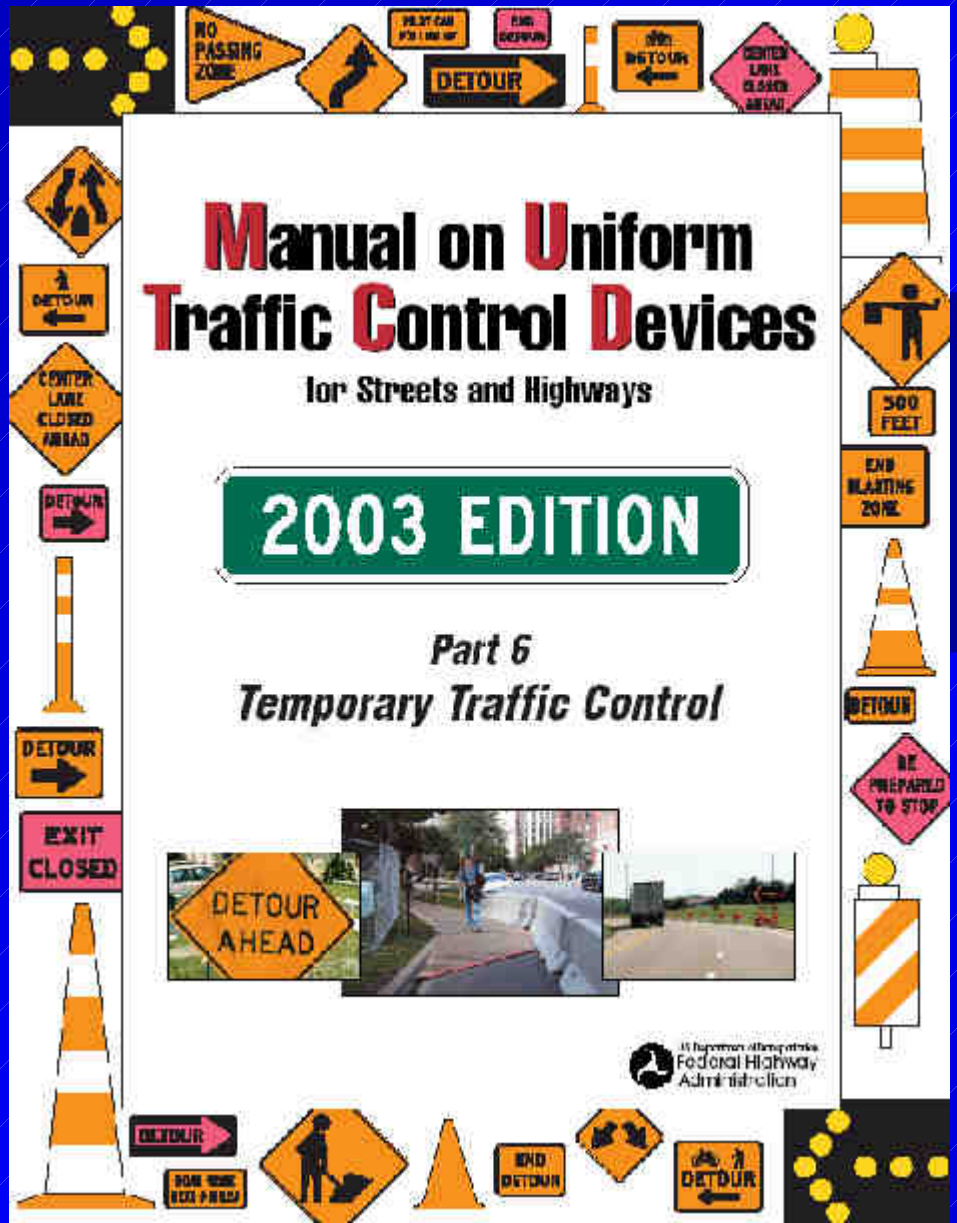
1. Background MUTCD Info.
2. “Work Zone” Speed Limit Reduction
3. “Temporary” Speed Limit Reduction
4. Ordinance Coordination
5. Citation vs. Conviction



“Work Zone” Speed Limit- Part 6 MUTCD



MUTCD, Part 6- “Fundamental Principles”



CHAPTER 6B. FUNDAMENTAL PRINCIPLES

Section 6B.01 Fundamental Principles of Temporary Traffic Control

Support:

Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control."

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

Construction, maintenance, utility, and incident zones can all benefit from TTC to compensate for the unexpected or unusual situations faced by road users. When planning for TTC in these zones, it can be assumed that it is appropriate for road users to exercise caution. Even though road users are assumed to be using caution, special care is still needed in applying TTC techniques.

Special plans preparation and coordination with transit, other highway agencies, law enforcement and other emergency units, utilities, schools, and railroad companies might be needed to reduce unexpected and unusual road user operation situations.

During TTC activities, commercial vehicles might need to follow a different route from passenger vehicles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous materials might need to follow a different route from other vehicles. The Hazardous Materials and National Network signs are included in Sections 2D.52 and 2D.57, respectively.

Experience has shown that following the fundamental principles of Part 6 will assist road users and help protect workers in the vicinity of TTC zones.

Guidance:

Road user and worker safety and accessibility in TTC zones should be an integral and high priority element of every project from planning through design and construction. Similarly, maintenance and utility work should be planned and conducted with the safety and accessibility of all motorists, bicyclists, pedestrians (including those with disabilities), and workers being considered at all times. If the TTC zone includes a highway-rail grade crossing, early coordination with the railroad company should take place.

Support:

Formulating specific plans for TTC at traffic incidents is difficult because of the variety of situations that can arise.

Guidance:

General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment, with the following factors being considered:

A. The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of TTC zones. The goal should be to make road users through these zones using roadway geometrics, roadside features, and TTC devices as nearly as possible comparable to those for normal highway situations.

B. A TTC plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied. Any changes in the TTC plan should be approved by an official knowledgeable (for example, trained and/or certified, in proper TTC practices).

Road user movement should be inhibited as little as practical, based on the following considerations:

A. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6C.01).

B. Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be avoided.

C. Provisions should be made for the reasonably safe operation of work, particularly on high speed, high volume roadways.

D. Road users should be encouraged to use alternative routes that do not include TTC zones.

E. Bicyclists and pedestrians, including those with disabilities, should be provided with access and reasonably safe passage through the TTC zone.

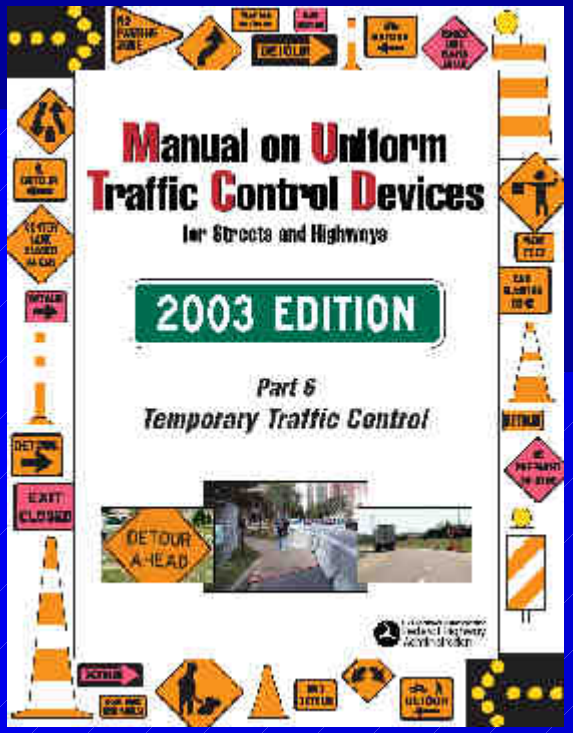
F. Roadway occupancy should be scheduled during off peak hours and, if necessary, night work should be considered.

G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before roadway or ramp closings.

Section 6B.01- Fundamental Principles of Temporary Traffic Control

Road user movement should be inhibited as little as practical, based on the following considerations:

A. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6C.01)



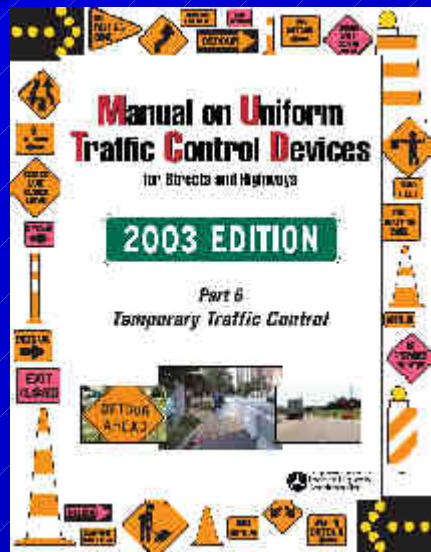
Section 6C.01- Temporary Traffic Control Plans

Reduced speed limits should be used only in the specific portion of the TTC zone where conditions or restrictive features are present.

However, frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can reasonably safely travel through the TTC zone with a speed limit reduction of no more than 10 mph.

A reduction of more than 10 mph in the speed limit should be used only when required by restrictive features in the TTC zone. Where restrictive features justify a speed reduction of more than 10 mph, additional driver notification should be provided.

The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC warning devices should be used.

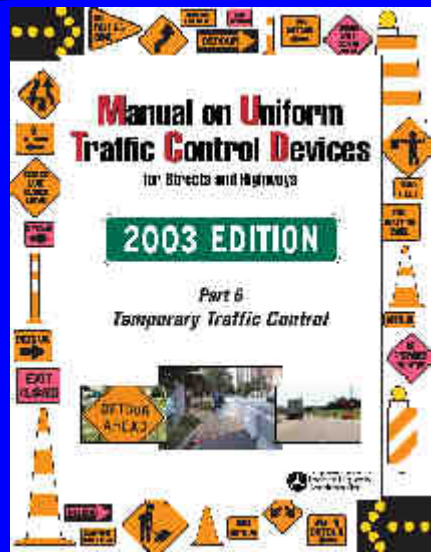


Section 6C.01- Temporary Traffic Control Plans

Reduced speed zoning (lowering the regulatory speed limit) should be avoided as much as practical because drivers will reduce their speeds only if they clearly perceive a need to do so.

Support:
Research has demonstrated that large reductions in the speed limit, such as a 30 mph reduction, increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to 10 mph cause smaller changes in speed variance and lessen the potential for increased crashes.

A reduction in the regulatory speed limit of only up to 10 mph from the normal speed limit has been shown to be more effective.

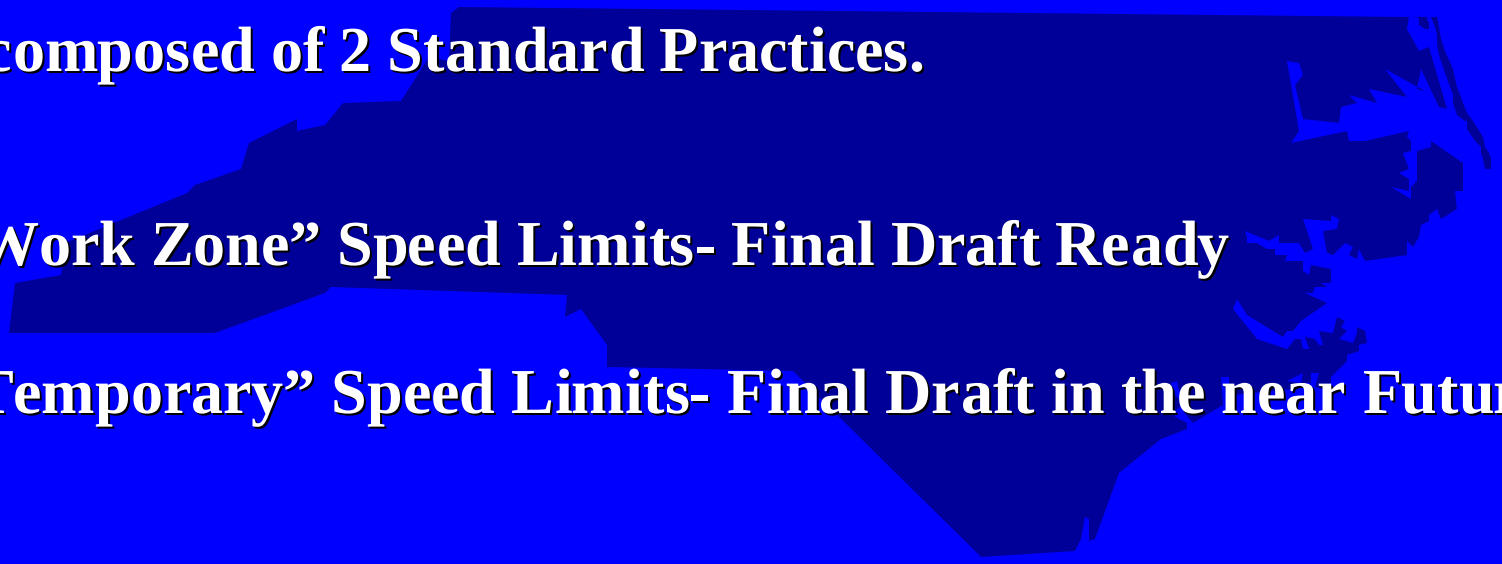


Introducing- The North Carolina Department of Transportation Division of Highways Traffic Engineering and Safety Systems Branch Standard Practice

For

Work Zone Speed Limit Reduction Guidelines for NC Highway Construction and Maintenance Activities

Work Zone Speed Limit Reduction Guidelines For NC Highway Construction and Maintenance Activities



It's composed of 2 Standard Practices.

A) "Work Zone" Speed Limits- Final Draft Ready

B) "Temporary" Speed Limits- Final Draft in the near Future

North Carolina Department of Transportation
Division of Highways
Traffic Engineering and Safety Systems Branch

Standard Practice
For
Work Zone Speed Limit Reduction Guidelines For NC Highway Construction and Maintenance Activities

Purpose: These guidelines provide proper guidance and uniformity on how and when interim speed limit reductions are established for highway work zones.

Objective: These guidelines provide methods of identifying the appropriate speed limit reduction specific to the type of work being performed on full control of access facilities in maintenance and construction work zones.

Guidelines: The Work Zone Traffic Control Unit in consultation with the Traffic Engineering Branch has developed the guidelines below to help coordinate and to implement "best strategies" to address work zone speed limits for construction and maintenance activities. In accordance with the provisions described in Chapters 6B,C and D of the MUTCD, these guidelines have been crafted to ensure thorough engineering study prior to implementation of interim speed limit reductions.

Speed limit reductions can be made in the interest of safety for the motoring public due to active project conditions, or they can be made if the reduction is intended for the safety of the construction worker due to excessive traffic speeds. Before a speed limit reduction is considered, a determination is to be made by the plan designer to identify if a speed limit reduction strategy is the best solution for the problem.

These guidelines have been developed to address the need and application for "Work Zone" speed limit reductions, which focus on the 'static' type of zone. These projects generally contain restrictive features throughout their entire length, which may require added decision making, increased reaction times, and other driver focused actions where slower speeds can allow for better driver recognition and reaction. Below are the definition, application and criteria for "Work Zone" Speed Limit reductions. Additional guidelines will be made available in the near future for "Temporary Speed Limit Reductions" used for short duration work activities, which will have a focus on worker safety.

Work Zone Speed Limits (See Attached Drawings)

A **"Work Zone" Speed Limit** is one that reduces the speed limit with standard stationary mounted speed limit signing and enacted ordinances for full control of access facilities.

"Work Zone" Speed Limit Reductions

Focus: Is on Motorist Safety on Full Control Access Facilities

Technique: Utilization of Regulatory Speed Limit Signs to reduce Speed Limit for "static" TIP type work zones where where long term restrictive features are present

Requirements: Meet Project Criteria and have signed ordinance by State Traffic Engineer

Goal: Voluntary Compliance because site conditions meet signed information

“Work Zone” Speed Limit Reduction

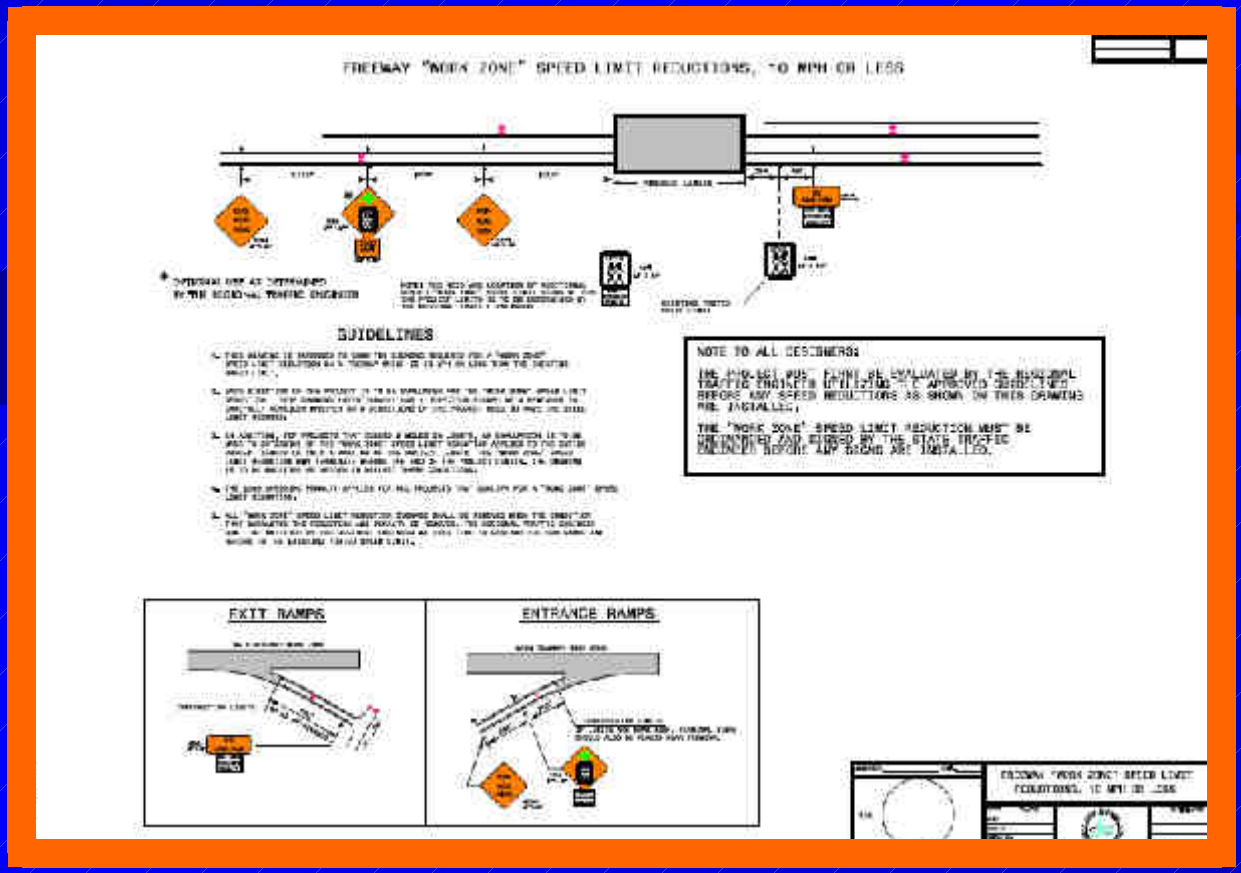
Features:

- **Criteria for Project Evaluation**
- **2 Detail Drawings for Sign Installation to Choose from**

    a) 10 MPH Speed Reduction

    b) 15 MPH Speed Reduction

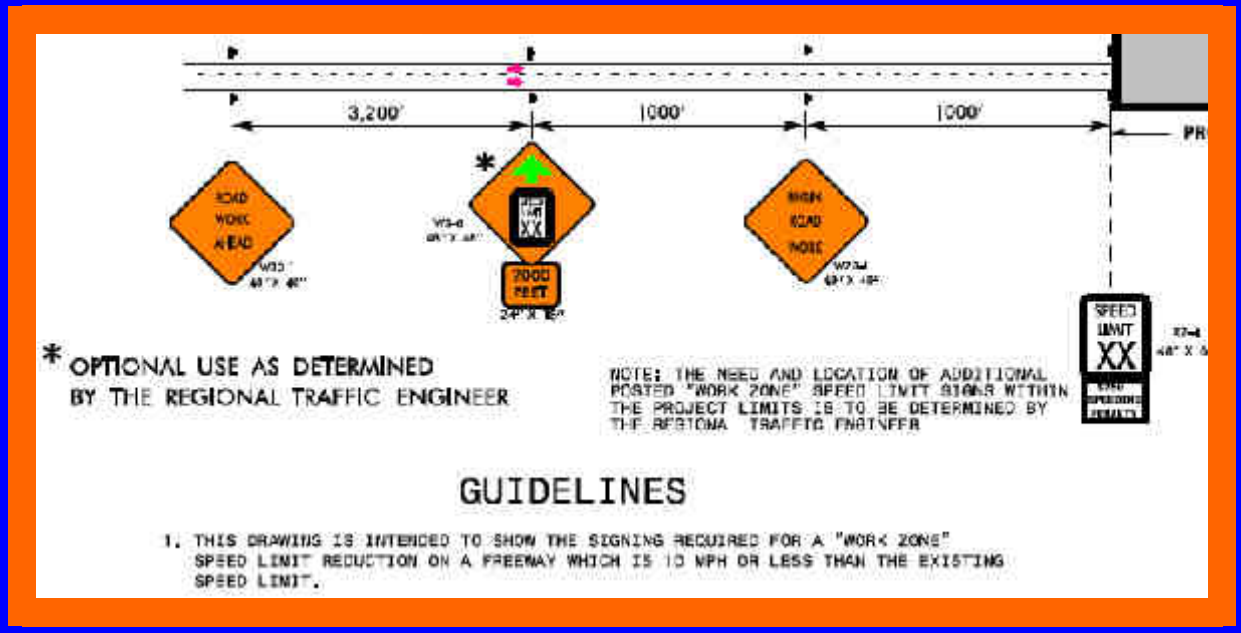
Work Zone Speed Limit Reduction- 10 MPH or Less



“Work Zone” Speed Limit- Changes to the “approach”

Optional utilization of Sign W3-5 w/Supplemental Distance Plate

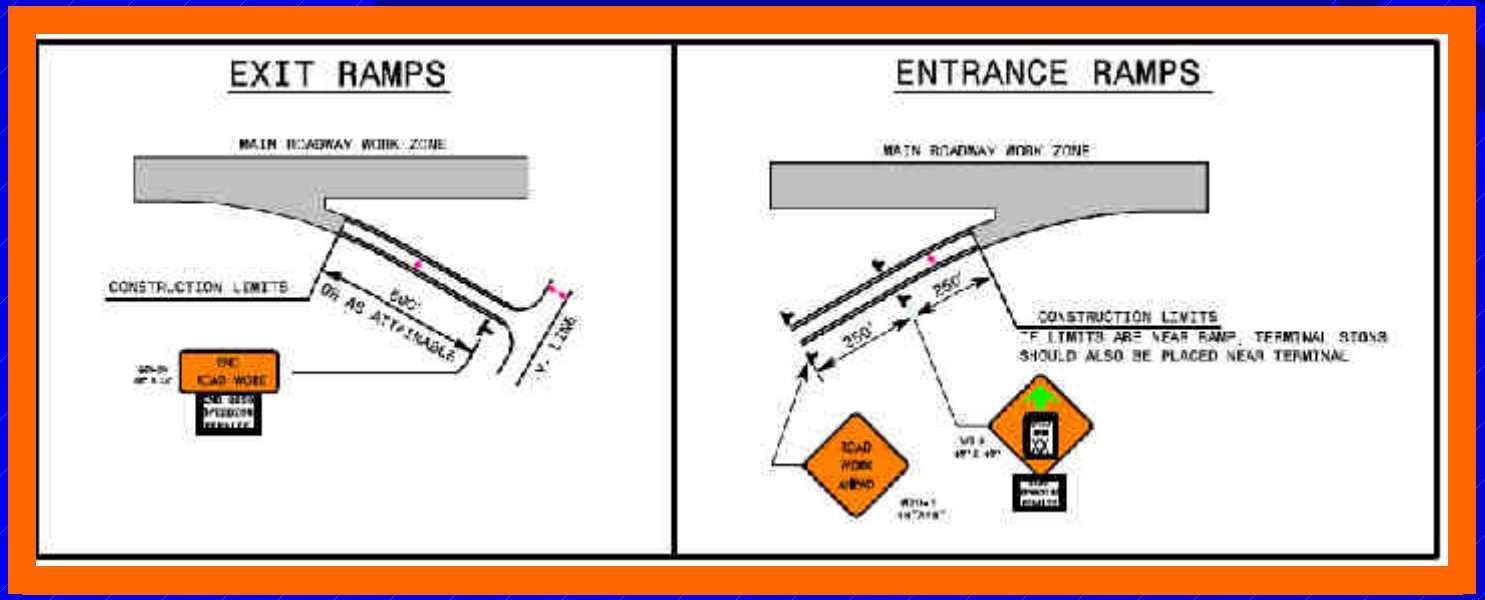
Work Zone Speed Limit Reduction AND Automatic $250 Speeding Penalty Located at Project Limits



Changes at the Ramps

Installation of “END” $250 Penalty w/ End Work Zone Sign

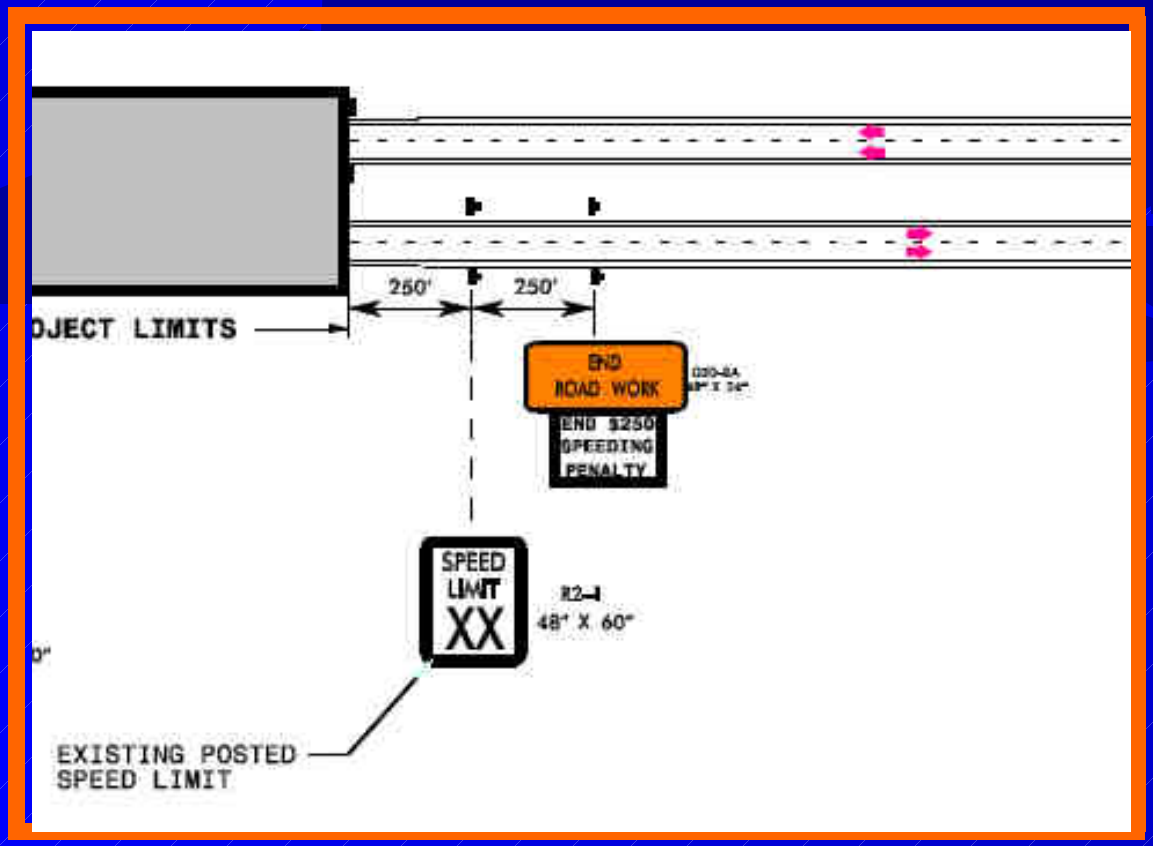
Utilization of Sign W3-5 w/Supplemental Distance Plate and $250 Penalty Sign



Changes to the “downstream”

Installation of “Existing” Speed Limit within 250’ of Project Limits

Installation of “END” $250 Penalty w/ End Work Zone Sign



“Guidelines”

GUIDELINES

1. THIS DRAWING IS INTENDED TO SHOW THE SIGNING REQUIRED FOR A "WORK ZONE" SPEED LIMIT REDUCTION ON A FREEWAY WHICH IS 10 MPH OR LESS THAN THE EXISTING SPEED LIMIT.

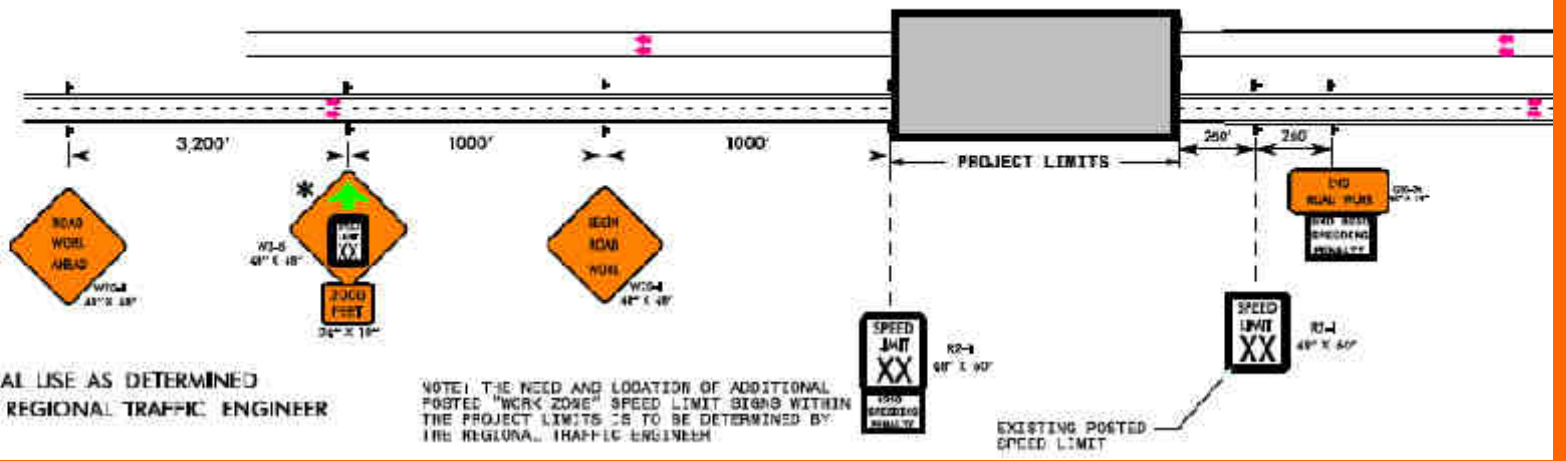
2. EACH DIRECTION OF THE PROJECT IS TO BE EVALUATED FOR THE "WORK ZONE" SPEED LIMIT REDUCTION. THIS DRAWING INTENTIONALLY HAS 1 DIRECTION SIGNED AS A REMINDER TO CAREFULLY CONSIDER WHETHER BOTH DIRECTIONS OF THE PROJECT NEED TO HAVE THE SPEED LIMIT REDUCED.

3. IN ADDITION, FOR PROJECTS THAT EXCEED 2 MILES IN LENGTH, AN EVALUATION IS TO BE MADE TO DETERMINE IF THE "WORK ZONE" SPEED LIMIT REDUCTION APPLIES TO THE ENTIRE PROJECT LENGTH OR ONLY A PORTION OF THE PROJECT LENGTH. THE "WORK ZONE" SPEED LIMIT REDUCTION MAY TERMINATE BEFORE THE END OF THE PROJECT LIMITS. THE DRAWING IS TO BE MODIFIED AS NEEDED TO REFLECT THESE CONDITIONS.

4. THE $250 SPEEDING PENALTY APPLIES FOR ALL PROJECTS THAT QUALIFY FOR A "WORK ZONE" SPEED LIMIT REDUCTION.

5. ALL "WORK ZONE" SPEED LIMIT REDUCTION SIGNAGE SHALL BE REMOVED WHEN THE CONDITION THAT WARRANTED THE REDUCTION AND PENALTY IS REMOVED. THE REGIONAL TRAFFIC ENGINEER SHALL BE NOTIFIED BY THE RESIDENT ENGINEER AT THIS TIME TO RESCIND THE ORDINANCE AND RETURN TO THE EXISTING POSTED SPEED LIMIT.

FREEWAY "WORK ZONE" SPEED LIMIT REDUCTIONS, 10 MPH OR LESS



* OPTIONAL USE AS DETERMINED BY THE REGIONAL TRAFFIC ENGINEER

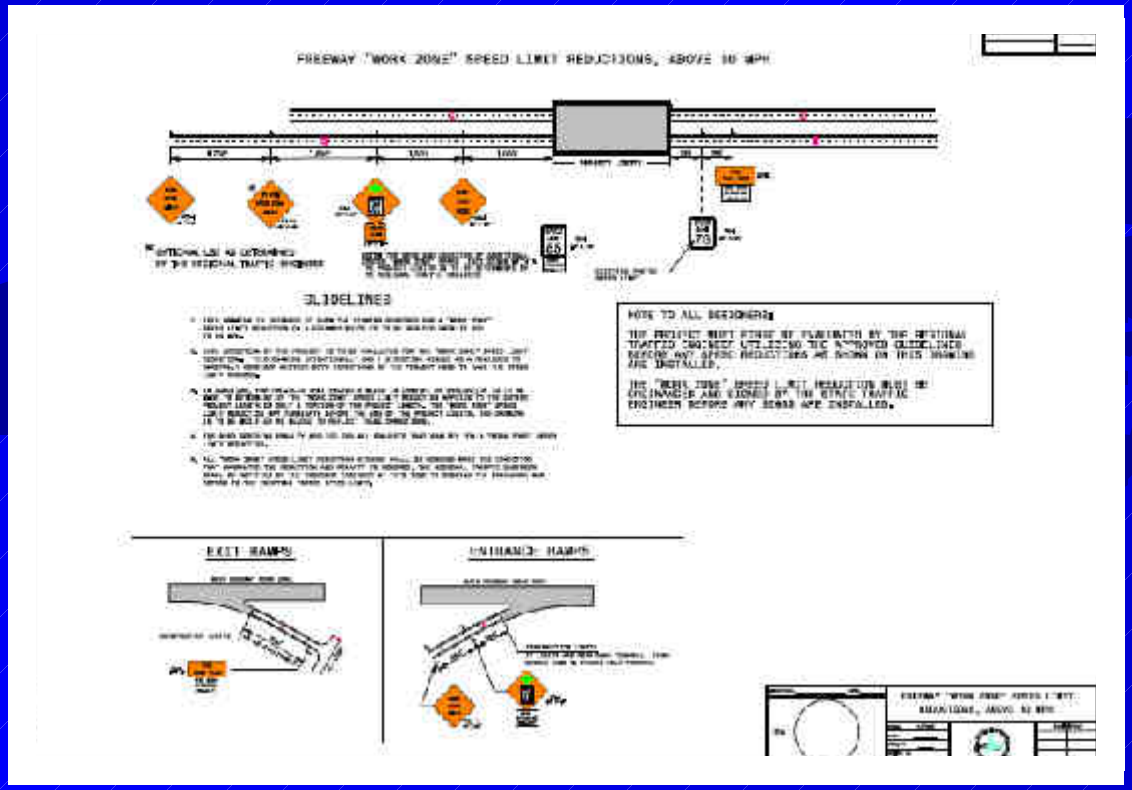
NOTE: THE NEED AND LOCATION OF ADDITIONAL POSTED "WORK ZONE" SPEED LIMIT SIGNS WITHIN THE PROJECT LIMITS IS TO BE DETERMINED BY THE REGIONAL TRAFFIC ENGINEER


ROAD
WORK
AHEAD
$ 250
PENALTY
ROAD
WORK
AHEAD
$ 250
PENALTY


ROAD
WORK
AHEAD
$ 250
PENALTY


SPEED
LIMIT
55
NO
PARKING
35

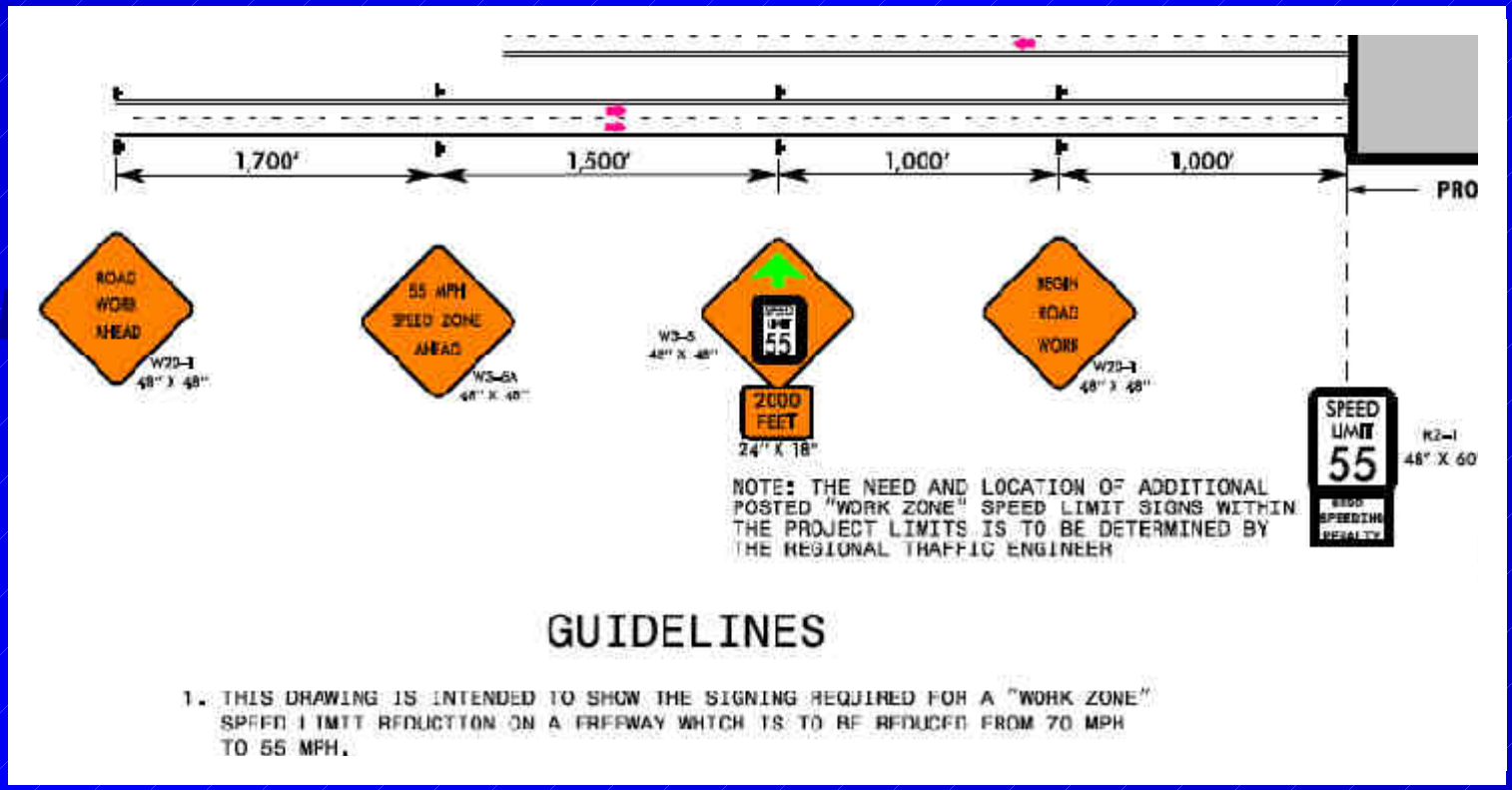
New WZ Speed Reduction Detail Drawing- Above 10 MPH



Changes to the “approach”

Uilization of Signs W3-5 and 5A to “double indicate” the 15 MPH reduction

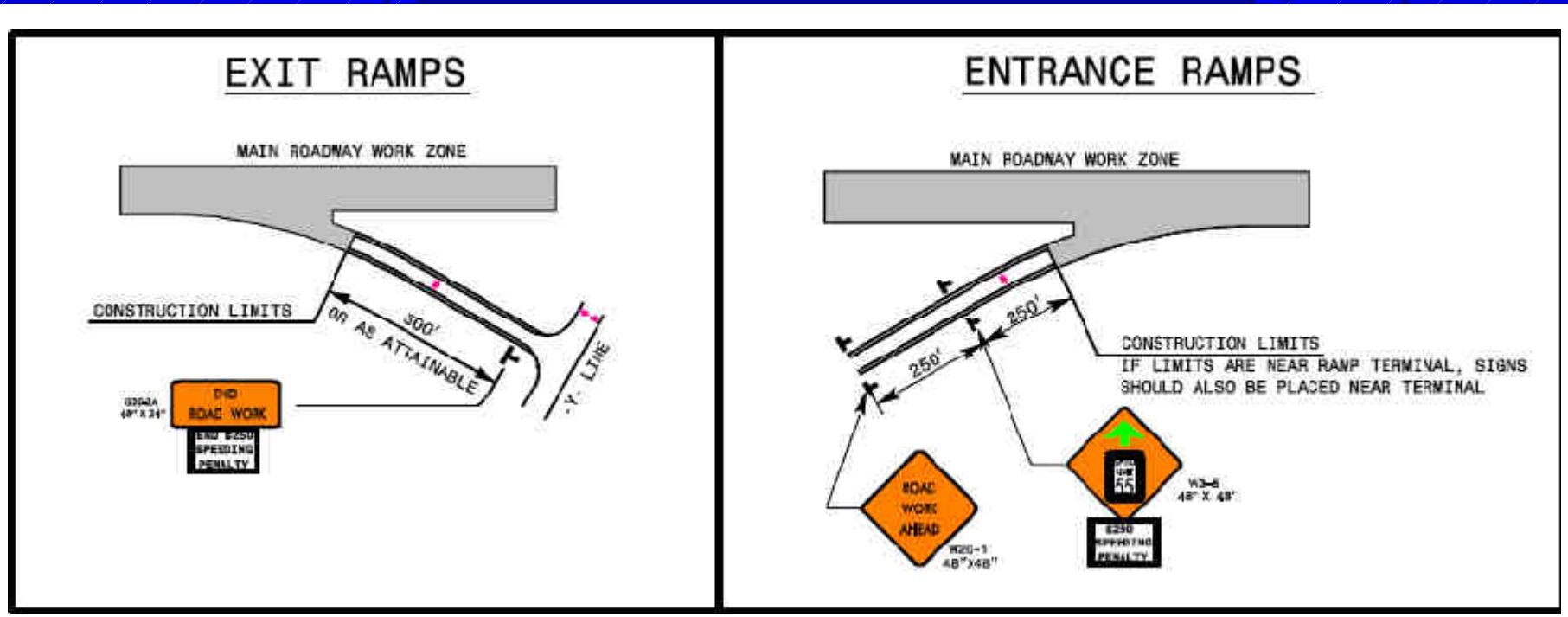
Speed Limit established at 55 MPH



Changes at the Ramps

Installation of "END $250 Penalty" w/ End Work Zone Sign

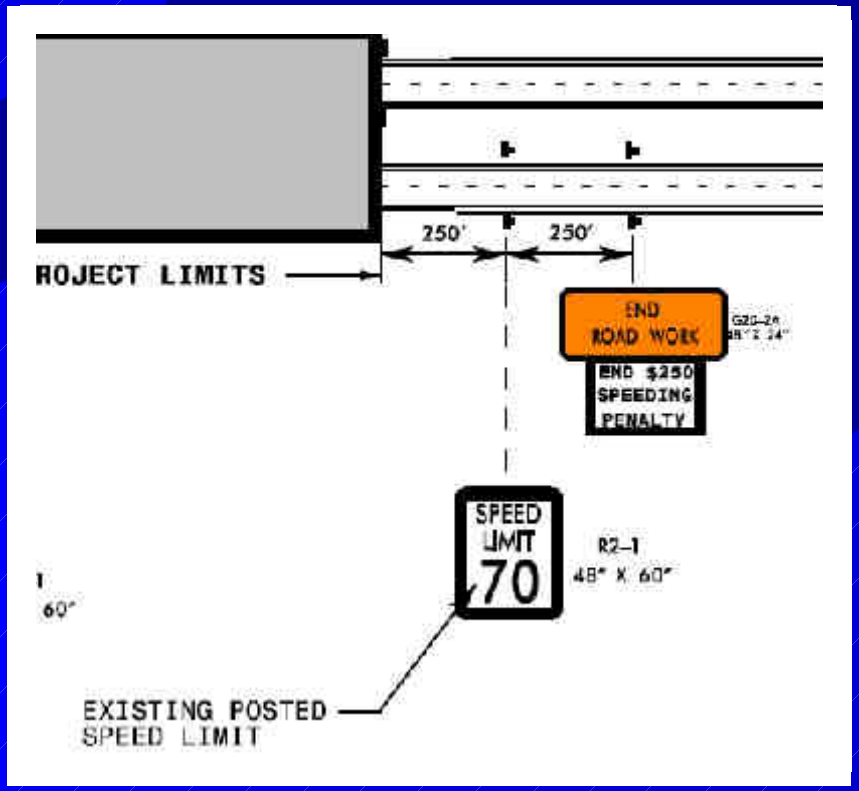
Utilization of Sign W3-5 w/Supplemental Distance Plate and $250 Penalty Sign



Changes to the “downstream”

Installation of “Existing” Speed Limit within 250’ of Project Limits

Installation of “END $250 Penalty” w/ End Work Zone Sign



“Guidelines”

GUIDELINES

1. THIS DRAWING IS INTENDED TO SHOW THE SIGNING REQUIRED FOR A "WORK ZONE" SPEED LIMIT REDUCTION ON A FREEWAY WHICH IS TO BE REDUCED FROM 70 MPH TO 55 MPH.

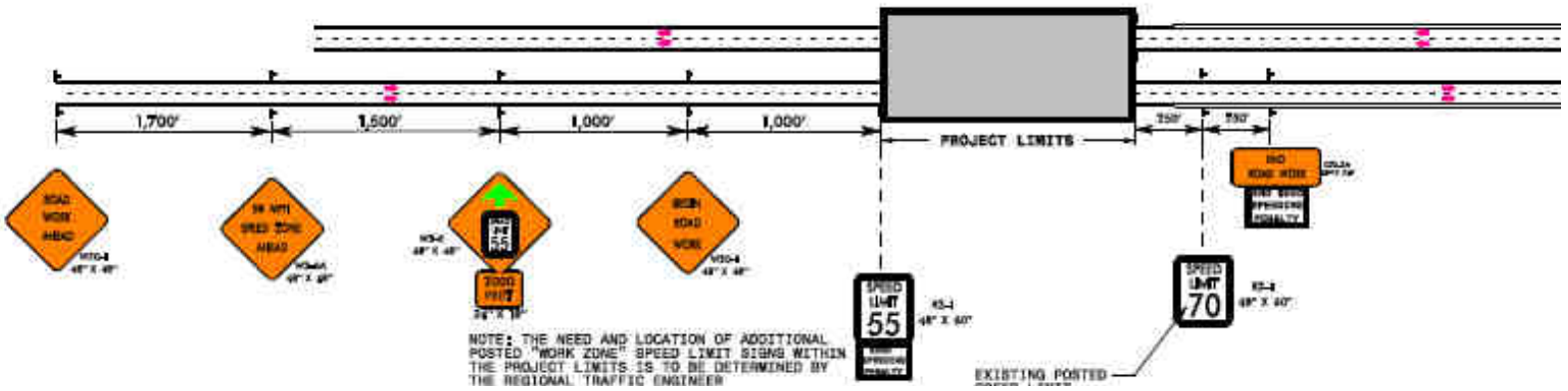
2. EACH DIRECTION OF THE PROJECT IS TO BE EVALUATED FOR THE "WORK ZONE" SPEED LIMIT REDUCTION. THIS DRAWING INTENTIONALLY HAS 1 DIRECTION SIGNED AS A REMINDER TO CAREFULLY CONSIDER WHETHER BOTH DIRECTIONS OF THE PROJECT NEED TO HAVE THE SPEED LIMIT REDUCED.

3. IN ADDITION, FOR PROJECTS THAT EXCEED 2 MILES IN LENGTH, AN EVALUATION IS TO BE MADE TO DETERMINE IF THE "WORK ZONE" SPEED LIMIT REDUCTION APPLIES TO THE ENTIRE PROJECT LENGTH OR ONLY A PORTION OF THE PROJECT LENGTH. THE "WORK ZONE" SPEED LIMIT REDUCTION MAY TERMINATE BEFORE THE END OF THE PROJECT LIMITS. THE DRAWING IS TO BE MODIFIED AS NEEDED TO REFLECT THESE CONDITIONS.

4. THE $250 SPEEDING PENALTY APPLIES FOR ALL PROJECTS THAT QUALIFY FOR A "WORK ZONE" SPEED LIMIT REDUCTION.

5. ALL "WORK ZONE" SPEED LIMIT REDUCTION SIGNAGE SHALL BE REMOVED WHEN THE CONDITION THAT WARRANTED THE REDUCTION AND PENALTY IS REMOVED. THE REGIONAL TRAFFIC ENGINEER SHALL BE NOTIFIED BY THE RESIDENT ENGINEER AT THIS TIME TO RESCIND THE ORDINANCE AND RETURN TO THE EXISTING POSTED SPEED LIMIT.

FREEWAY "WORK ZONE" SPEED LIMIT REDUCTIONS, ABOVE 10 MPH



“Temporary” Speed Limit Reductions

These aren’t yet ready for final draft status, but will be completed once the final reviews and external partners have been briefed and allowed to comment.

"Temporary" Speed Limit Reductions

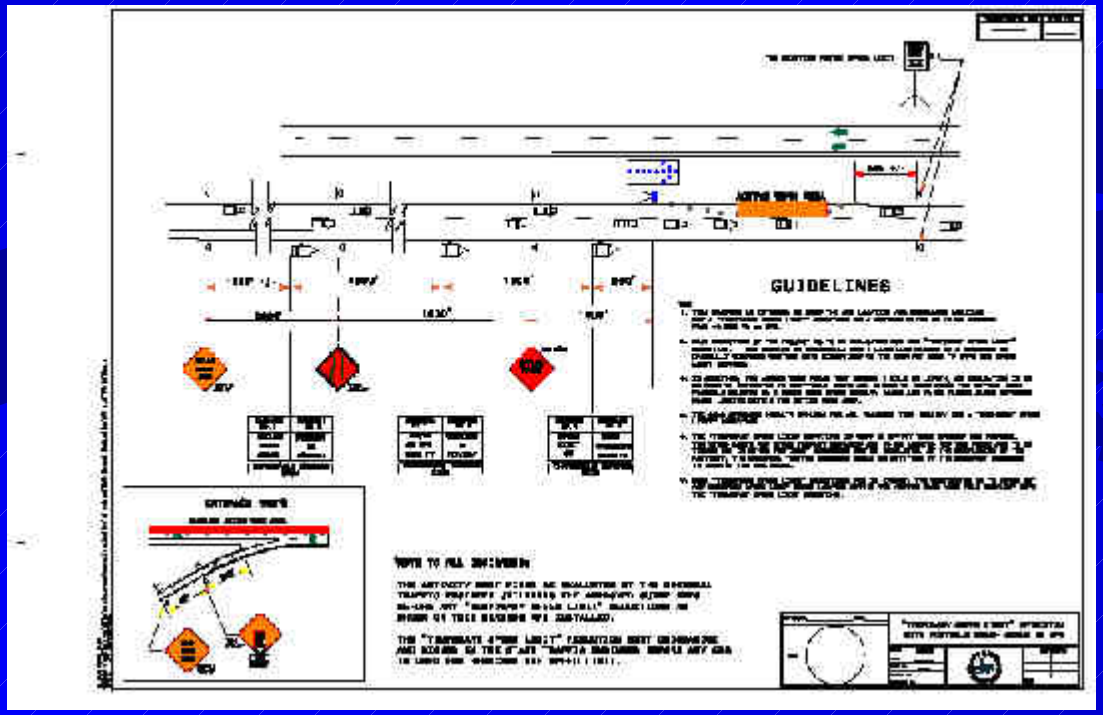
Focus: Is on Worker Safety on Full Control Access Facilities for "spot specific" activities such as paving or pavement repair

Technique: Utilization of Portable CMS's to reduce Speed Limit just in advance of the work activity

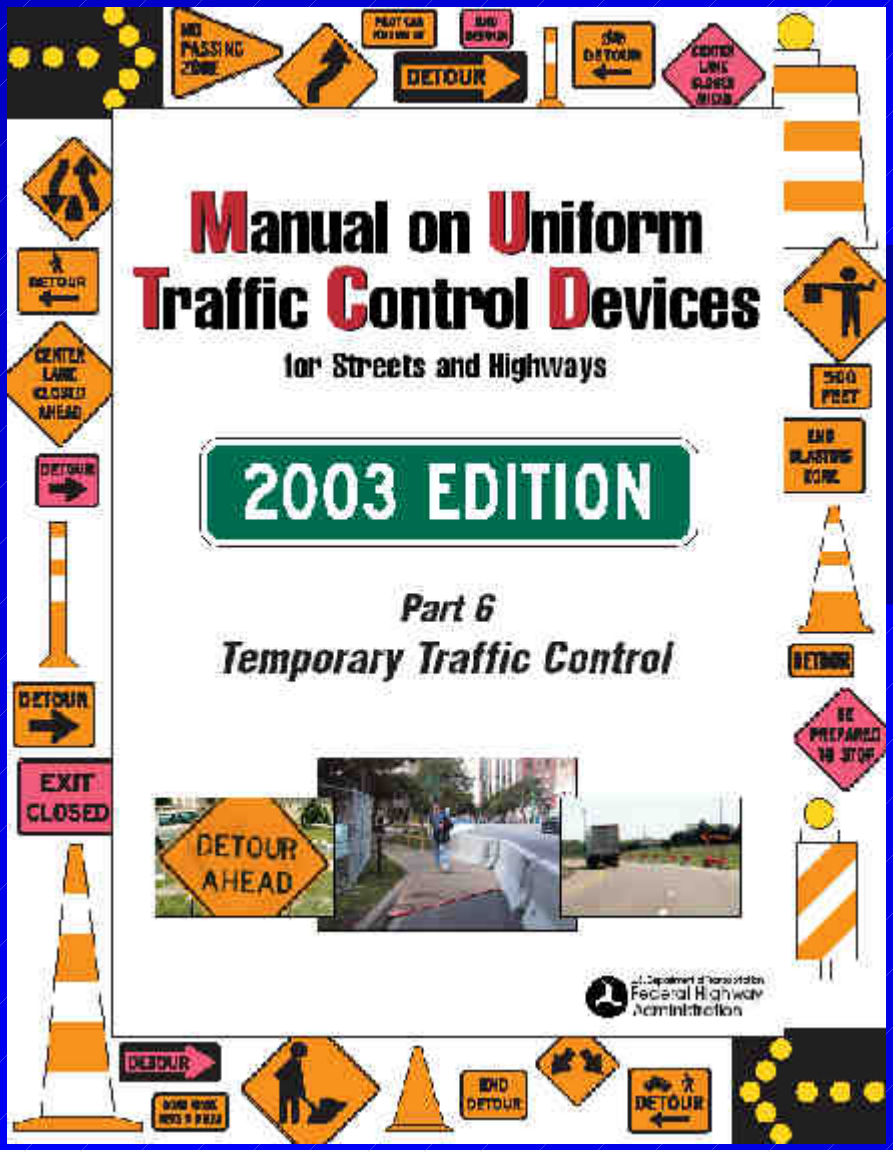
Requirements: Meet Project Criteria and have signed ordinance by State Traffic Engineer

Goal: Voluntary Compliance because site conditions meet signed information

“Temporary” Speed Limit Reductions



Chapter 6D. Pedestrian and Worker Safety



2003 Edition

Page 6D-1

CHAPTER 6D. PEDESTRIAN AND WORKER SAFETY

Section 6D.01 Pedestrian Considerations

Support:

Whenever the acronym "TTC" is used in this Chapter, it refers to "temporary traffic control".

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians) within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130 through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6D.02.

The most desirable way to provide information to pedestrians with visual disabilities that is equivalent to visual signage for notification of sidewalk closures is a speech message provided by an audible information device. Devices that provide speech messages in response to passive pedestrian actuation are the most desirable. Other devices that continuously emit a message, or that emit a message in response to use of a pushbutton, are also acceptable. Signage information can also be transmitted to personal receivers, but currently such receivers are not likely to be carried or used by pedestrians with visual disabilities in TTC zones. Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities.

Guidance:

If a pushbutton is used to provide equivalent TTC information to pedestrians with visual disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with visual disabilities that a special accommodation is available, and to help them locate the pushbutton.

Standard:

The various TTC provisions for pedestrian and worker safety set forth in Part 6 shall be applied by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.

Advance notification of sidewalk closures shall be provided to the maintaining agency. Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability, traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.

Support:

It must be recognized that pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance or out-of-the-way travel to a destination.

Guidance:

Adequate provisions should be made for persons with disabilities as determined by an engineering study or by engineering judgment. Because limited sight and narrow delineation are not usable by pedestrians with visual disabilities, blocked lanes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing audible information devices, accessible pedestrian signals, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have low vision.

The following items should be considered when planning for pedestrians in TTC zones:

A. Pedestrians should not be led into conflicts with work site vehicles, equipment, and operations.
B. Pedestrians should not be led into conflicts with vehicles moving through or around the work site.
C. Pedestrians should be provided with a reasonably safe, convenient, and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s). Where pedestrians who have visual disabilities encounter work sites that require them to cross the roadway to find an accessible route, instructions should be provided using an audible information device. Accessible pedestrian signals (see Section 4E.06) with accessible pedestrian detectors (see Section 4E.09) might be needed to enable pedestrians with visual disabilities to cross wide or heavily traveled roadways.

A pedestrian route should not be severed and/or moved for nonconstruction activities such as parking for vehicles and equipment.

Sept. 8, 2003

Section 6D.03 Worker Considerations

Section 6D.03 Worker Safety Considerations

Support:

Equally as important as the safety of road users traveling through the TTC zone is the safety of workers. TTC zones present temporary and constantly changing conditions that are unexpected by the road user. This creates an even higher degree of vulnerability for workers on or near the roadway.

Guidance:

The following are the key elements of worker safety and TTC management that should be considered to improve worker safety:

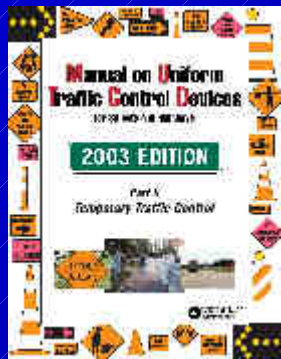
A. Training—

B. Worker Safety Apparel—

C. Temporary Traffic Barriers—

D. Speed Reduction—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, or the use of uniformed law enforcement officers or flaggers, should be considered.

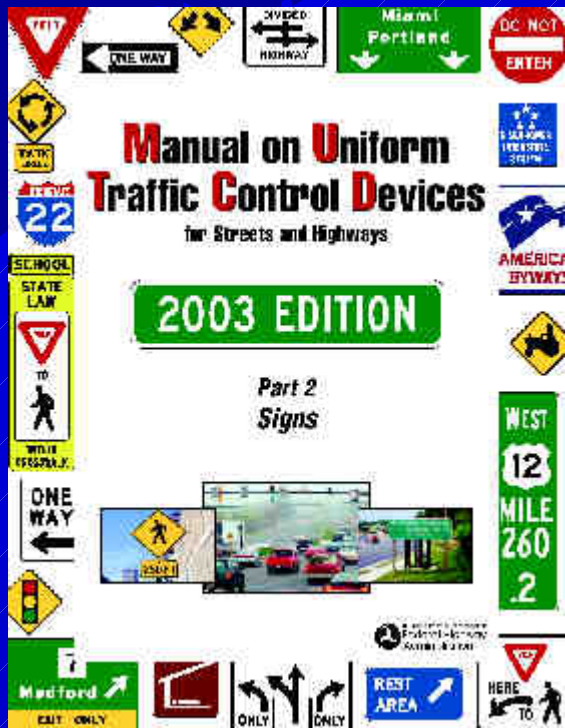
E. Activity Area—



MUTCD Part 2, Section 2B Regulatory Signs

Section 2B.12 Speed Limit Sign (R2-1)

A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is shown at the proper times.



General Statute GS-141

§ 20-141. Speed restrictions.

(a) No person shall drive a vehicle on a highway or in a public vehicular area at a speed greater than is reasonable and prudent under the conditions then existing.

(c) Except while towing another vehicle, or when an advisory safe-speed sign indicates a slower speed, or as otherwise provided by law, it shall be unlawful to operate a passenger vehicle upon the interstate and primary highway system at less than the following speeds:

(1) Forty miles per hour in a speed zone of 55 miles per hour.

(2) Forty-five miles per hour in a speed zone of 60 miles per hour or greater.

These minimum speeds shall be effective only when appropriate signs are posted indicating the minimum speed.

(d) (1) Whenever the Department of Transportation determines on the basis of an engineering and traffic investigation that any speed allowed by subsection (b) is greater than is reasonable and safe under the conditions found to exist upon any part of a highway outside the corporate limits of a municipality or upon any part of a highway designated as part of the Interstate Highway System or any part of a controlled-access highway (either inside or outside the corporate limits of a municipality), the Department of Transportation shall determine and declare a reasonable and safe speed limit.

General Statute GS-141

(2) Whenever the Department of Transportation determines on the basis of an engineering and traffic investigation that a higher maximum speed than those set forth in subsection (b) is reasonable and safe under the conditions found to exist upon any part of a highway designated as part of the Interstate Highway System or any part of a controlled-access highway (either inside or outside the corporate limits of a municipality) the Department of Transportation shall determine and declare a reasonable and safe speed limit. A speed limit set pursuant to this subsection may not exceed 70 miles per hour.

Speed limits set pursuant to this subsection are not effective until appropriate signs giving notice thereof are erected upon the parts of the highway affected.

General Statute GS-141

(j2) A person who drives a motor vehicle in a highway work zone at a speed greater than the speed limit set and posted under this section shall be required to pay a penalty of two hundred fifty dollars ($250.00).

This penalty shall be imposed in addition to those penalties established in this Chapter. A "highway work zone" is the area between the first sign that informs motorists of the existence of a work zone on a highway and the last sign that informs motorists of the end of the work zone.

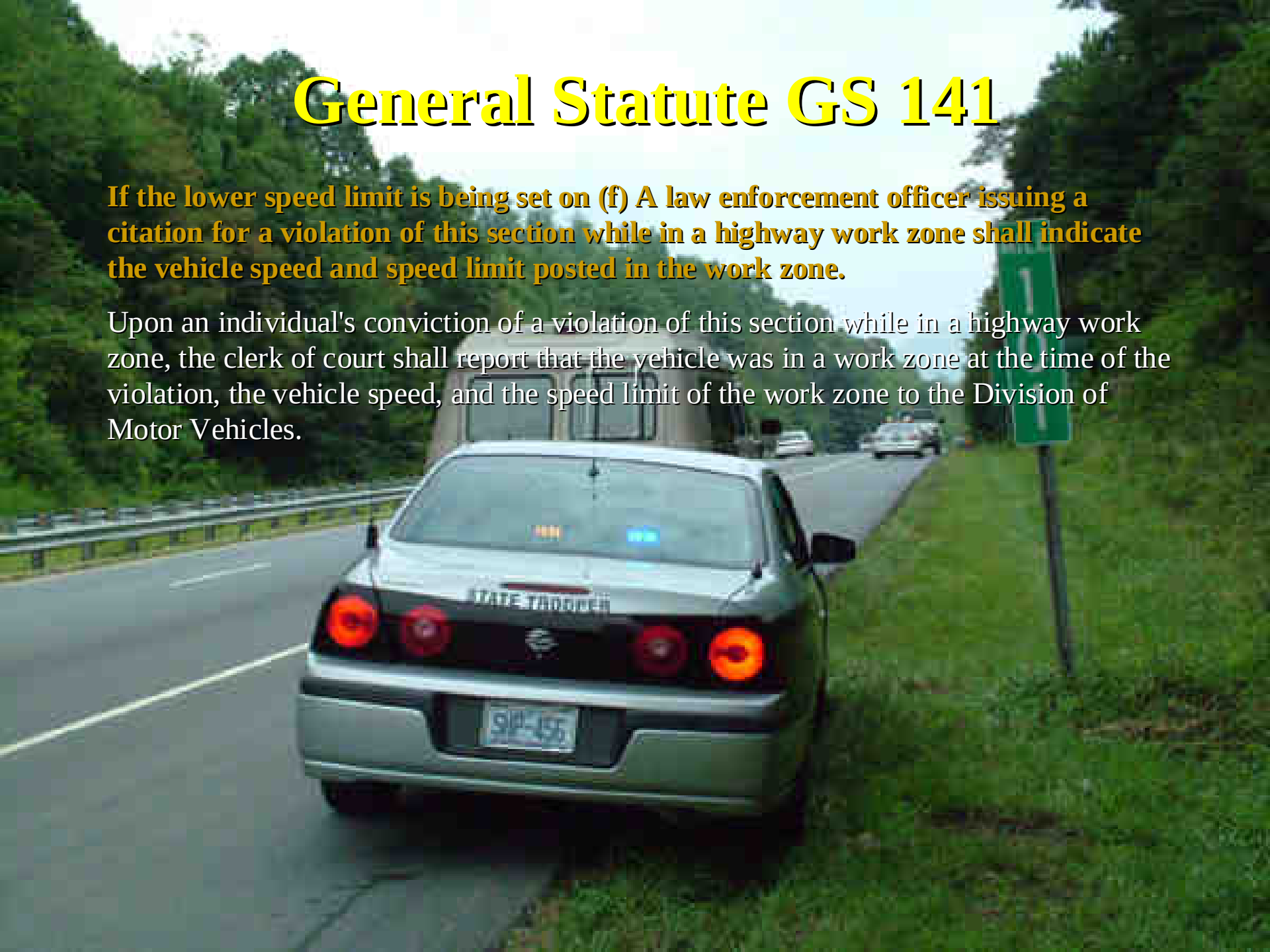
This subsection applies only if a sign posted at the beginning of the highway work zone states the penalty for speeding in the work zone.

The Secretary shall ensure that work zones shall only be posted with penalty signs if the Secretary determines, after engineering review, that the posting is necessary to ensure the safety of the traveling public due to a hazardous condition.

General Statute GS 141

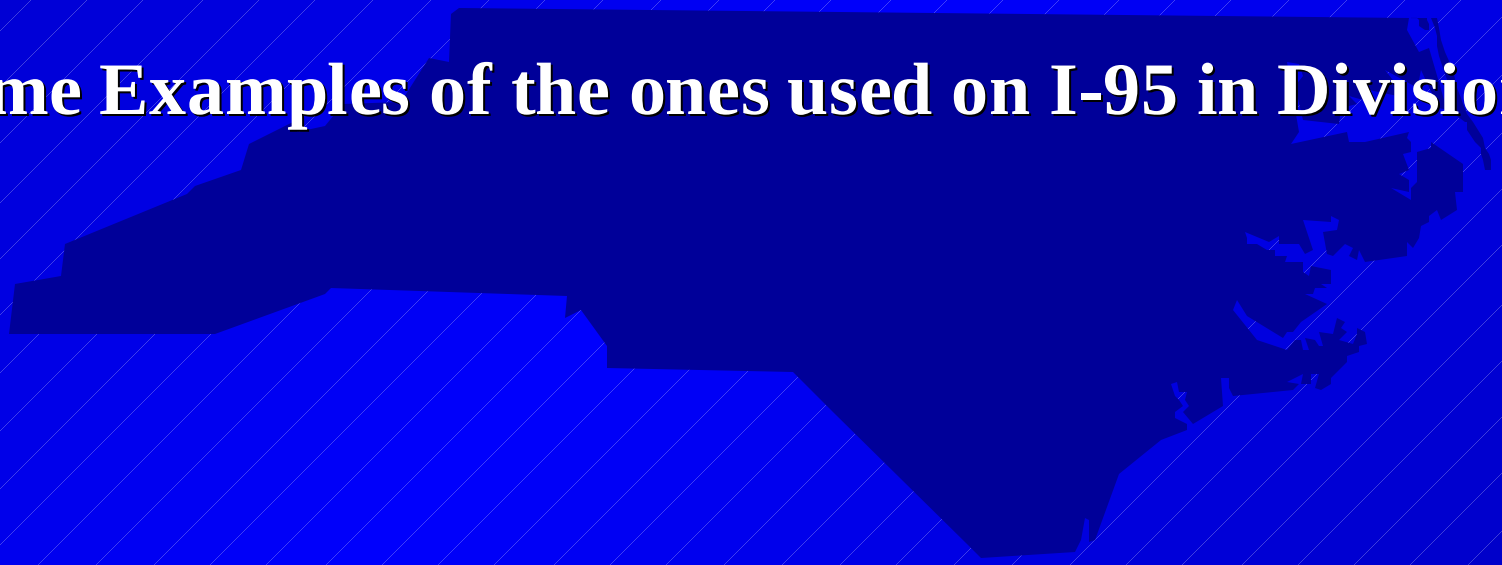
If the lower speed limit is being set on (f) A law enforcement officer issuing a citation for a violation of this section while in a highway work zone shall indicate the vehicle speed and speed limit posted in the work zone.

Upon an individual's conviction of a violation of this section while in a highway work zone, the clerk of court shall report that the vehicle was in a work zone at the time of the violation, the vehicle speed, and the speed limit of the work zone to the Division of Motor Vehicles.



“Temporary” Speed Limit Reductions

Some Examples of the ones used on I-95 in Division 4




RT LANE
CLOSED
AHEAD


PREPARE
TO
MERGE


REDUCE
SPEED
AHEAD


WORKERS
NEAR
ROADWAY


SPEED
LIMIT
55


SPEED LIMIT
ENFORCED BY
AIRCRAFT

Ordinance Coordination

I. Pre-Construction Process

1. Designer of TCP's evaluates the criteria during the design process

2. If project meets criteria, discuss with RTE to ensure project meets criteria and if so, establish the speed limit

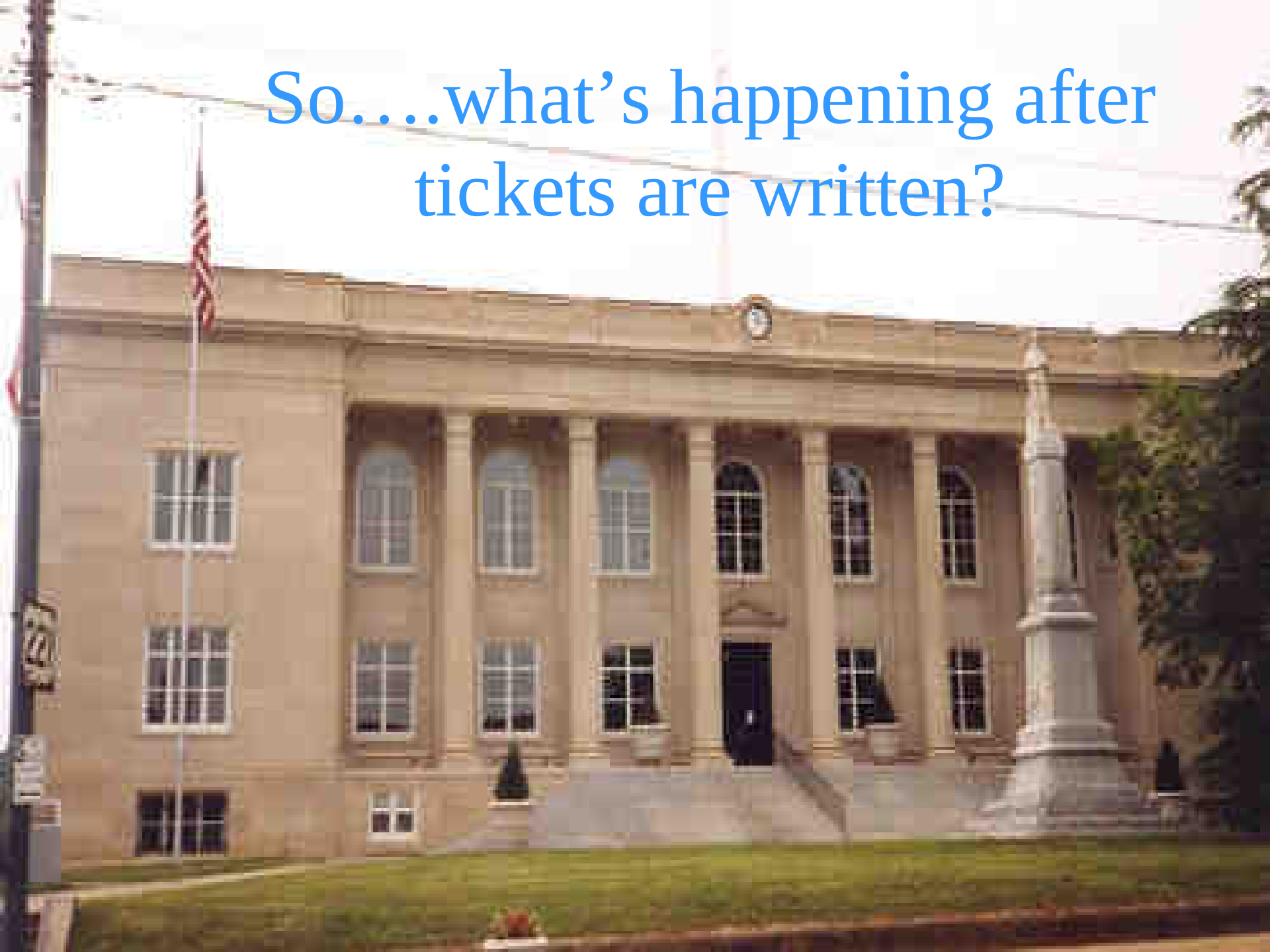
3. WZTCU sends letter to RTE requesting the ordinance for the speed reduction.

4. RTE sends ordinance to State Traffic Engineer for Signature

5. Designer includes appropriate sign drawing in the TCP

* During Project Construction, same process applies

So….what's happening after tickets are written?



Citation versus Conviction

Summary of 2004 Work Zone Speeding Citations

(Source: Office of Administrative Courts)

39% Convicted of Speeding

- **13% Convicted of "speeding w/ improper equipment"**
- **11 % Convicted of Lesser Charges**
- **36% Dismissed with NO Conviction**

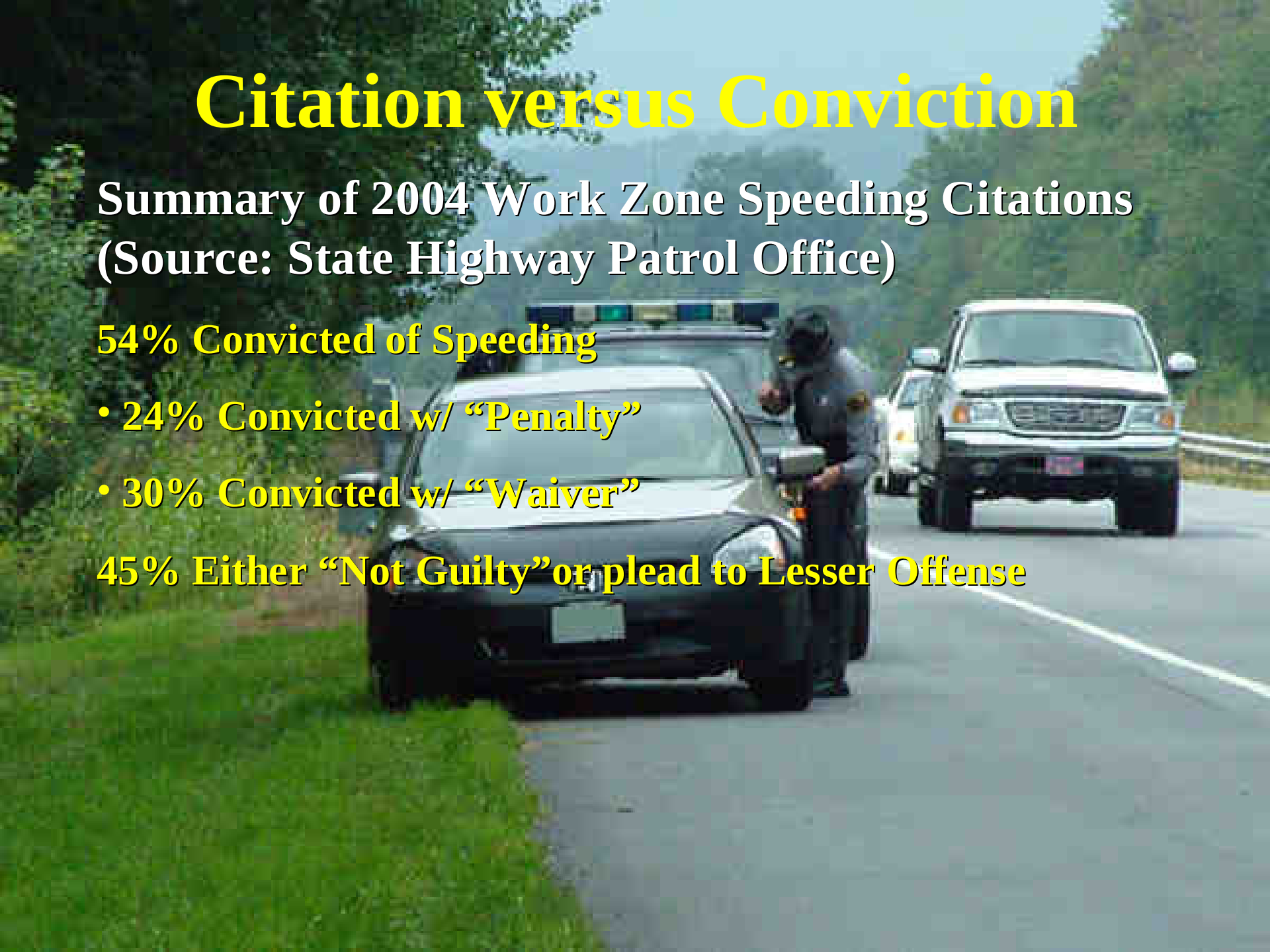
Citation versus Conviction

Summary of 2004 Work Zone Speeding Citations (Source: State Highway Patrol Office)

54% Convicted of Speeding

- **24% Convicted w/ “Penalty”**
- **30% Convicted w/ “Waiver”**

45% Either “Not Guilty” or plead to Lesser Offense



Is the Judicial System really capable of influencing driver behavior as it relates to speeding?

Status of Implementation

1) “Work Zone” Speed Limit Criteria and Drawings

- Final Draft Completed
- Going to Operations Staff Meeting in September
- Looking to Finalize and Implement by October

2) “Temporary Speed Limit” Criteria and Drawings

- Final Comments to be received by October
- Final Draft to be completed by November
- Looking to Finalize by December and Implement by Jan. 07

Que sion

Signs- The evolution of "innovation!"

IV. Internal Traffic Control Plan-Speed Enforcement

Safety- Don’t be complacent!